REMARKS

Claims 1-4, 12-27, and 47-59 remain pending and under consideration. Claims 1, 12, 16-20, and 23 are independent claims. Claims 5-11, 28-46, and 60-74 drawn to non-elected species and Claims 75-139 drawn to non-elected inventions are currently withdrawn from consideration. Reconsideration of the application is hereby respectfully requested.

Examiner has rejected Claims 1-4, 12-18, 23-27, and 47-59 under 35 USC §103(a) as being unpatentable over Abeles (US6445724).

The rejections are overcome since it is believed that Claims 1-4, 12-18, 23-27, and 47-59 patentably distinguish over Abeles, for reasons set forth hereinbelow.

Regarding Claims 1 and 23, Examiner has stated that:

> Abeles discloses an optical device (fig 4), comprising: a transmission optical waveguide (303 and 352); and an optical device component (340 and 341) transverse-coupled to the transmission optical waveguide so as to enable optical power transfer therebetween, the transmission optical waveguide being adapted for at least one of receiving optical signal power from an optical signal transmission system and transmitting optical signal power to the optical signal transmission system, the optical device component including a laterally-confined multi-layer dispersion-engineered waveguide structure (300b) including at least one multi-layer reflector stack (340 or 341), the optical device component being transverse-coupled to the transmission optical waveguide at the multi-layer waveguide structure.

Applicants respectfully submit that these assertions are incorrect for reasons set forth hereinbelow. While the device of Abeles might appear superficially similar in some respects to the apparatus of Claims 1 and 23, they are in fact quite different.

First, characterization of elements 303 and 352 of Fig. 4 of Abeles as a "transmission optical waveguide ... adapted for at least one of receiving optical signal power from an optical signal transmission system and transmitting optical signal power to the optical signal transmission system" is inconsistent with the disclosure of Abeles. Abeles very specifically describes elements 303 and 352 as gratings, not waveguides.

Grating 352 acts as a wavelength selective element for oscillator 301 (Abeles column 5 lines 36-61). Grating 303 acts as an out-of-plane optical coupler between expansion region 302 and vertical-cavity amplifier 304 (Abeles column 6 line 51 through column 7 line 11). Gratings 303 and 352 therefore cannot be characterized as the "transmission optical waveguide" of Claims 1 and 23. Applicants further respectfully submit that Abeles discloses no other element corresponding to the "transmission optical waveguide" of Claims 1 and 23, nor is there any disclosure in Abeles of transmission between such an element and an "optical transmission system".

Second, characterization of elements 340 and 341 as "an optical device component ... transverse-coupled to the transmission optical waveguide so as to enable optical power transfer therebetween, ... the optical device component being transverse-coupled to the transmission optical waveguide at the multi-layer waveguide structure" is inconsistent with the disclosure of Abeles and with the well-understood meaning of "transverse-coupled", both as a term of art and as clearly defined in the present specification. The optical coupling disclosed in Abeles to elements 340 and 341 is not transverse-coupling, but end-coupling. Abeles (column 6 lines 51-54) very clearly discloses that: "The expansion region 302 and grating region 303 are configured so as to provide radiation from oscillator 301 either perpendicularly (along z axis) to or at a tilted angle (within x-z plane) into vertical-cavity amplifier 303", with the vertical-cavity amplifier being defined by multi-layer reflector elements 340 and 341. Optical propagation in the expansion region 302 is along the x-axis (as defined by Abeles), while the vertical-cavity amplifier supports resonant optical modes propagating along the z-axis (as defined by Abeles), with grating 303 redirecting a portion of the optical power from the expansion region into the vertical-cavity amplifier. Therefore, the optical coupling disclosed by Abeles cannot be construed as meeting the limitation of "transverse-coupled" of claims 1 and 23. Nor is there any motivation for modifying the device of Abeles for implementing transverse-coupling, since the substantially orthogonal optical propagation directions of the oscillator 301 and the vertical-cavity amplifier 304 are incompatible with transverse-coupling.

Since various elements and limitations of Claims 1 and 23 are not disclosed by Abeles, and since there is no suggestion or motivation in Abeles for including the missing elements and limitations, Applicants respectfully submit that rejection of Claims 1 and 23 under 35 USC §103 over Abeles is improper, and should be withdrawn.

Applicants further respectfully submit that modification of the device of Abeles to include "a laterally-confined multi-layer dispersion-engineered waveguide structure

including at least one multi-layer reflector stack" would render the device of Abeles inoperative. The multi-layer reflectors 340 and 341 of Abeles serve as resonator end-mirrors for vertical-cavity amplifier 304. For the vertical-cavity amplifier to function, resonant optical modes thereof must be optically confined in both horizontal dimensions. In order to function as a multi-layer waveguide structure as recited in Claims 1 and 23, optical confinement along one horizontal dimension (the propagation direction) of the waveguide must be substantially eliminated, rendering the device of Abeles inoperative for its intended purpose. Any rejection of a claim under 35 USC §103 over Abeles based on such a modification is therefore improper, and should be withdrawn (*In re Gordon*, 733 F.2d 900, 221 USPQ 1125).

Regarding Claims 2-4, Examiner has stated that

> Abeles's disclosure further shows that the device has a low-index waveguide being a fiber optic transmission (col. 5, lines 35-60) waveguide being adapted for transverse-coupling, wherein the waveguide is adapted for at least one of receiving an optical signal from a fiber-optic telecommunication system and transmitting optical signal power to a fiber optic telecommunication system (col. 1, lines 20-40).

Applicants respectfully point out that none of the materials recited by Abeles at column 5 lines 35-60 meet the limitation of "low-index", which is explicitly defined in the present specification as having an index below about 2.5. All of the materials listed by Abeles at column 5 lines 35-60 are high-index semiconductors (index above about 2.5), and therefore do not meet the limitation of "a low-index optical waveguide". Second, there is no teaching, suggestion, or motivation in Abeles that the structure characterized by the Examiner as the "transmission optical waveguide" (i.e., elements 303 and 352), or any other element of the Abeles device, could take the form of an optical fiber. Abeles in fact teaches away from such an implementation, since the disclosure of Abeles is directed toward integrated devices where all elements are formed on a common substrate (column 3 lines 43-46). Since limitations of Claims 2-4 are not disclosed by Abeles, and since there is no suggestion or motivation in Abeles for including the missing limitations, Applicants respectfully submit that rejection of Claims 2-4 under 35 USC §103 over Abeles is improper, and should be withdrawn.

With regard to Claim 16, Examiner has asserted that "Abeles's discloses that part of the waveguide is tapered and transverse coupled". First, Abeles only discloses end coupling of optical power, as discussed hereinabove, but nowhere shows, teaches, or suggests transverse coupling. Further, Abeles does not show, teach, or suggest use of an optical fiber (tapered or otherwise) as a transmission optical waveguide, and in fact teaches away from such an implementation, as discussed hereinabove. Since limitations of Claim 16 are not disclosed by Abeles, and since there is no suggestion or motivation in Abeles for including the missing limitations, Applicants respectfully submit that rejection of Claim 16 under 35 USC §103 over Abeles is improper, and should be withdrawn.

Regarding Claims 26 and 27, Examiner has asserted that:

> Abeles's disclosure shows (fig. 4) two waveguide layers; the first (351) for guiding a surface guided optical mode above a single multi-layer reflector stack (340), and the second (342) for guiding an optical mode along a core layer between two reflector stacks (341 and 340).

Applicants respectfully submit that these characterizations are inconsistent with the disclosure of Abeles. Abeles specifically discloses an isolation layer 350 between layer 351 and multi-layer reflector stack 340 (Fig. 4 and column 5 lines 58-61), which would prevent interaction with an optical mode supported by layer 351 with multi-layer reflector 340. Nor could an optical mode supported by layer 351 be accurately described as a surface-guided mode as that term is understood by those skilled in the art. The vertical-cavity amplifier 304 of Abeles (including layer 342 between multi-layer reflectors 340 and 341) functions by supporting resonant modes propagating vertically and substantially confined in both horizontal dimensions (as discussed hereinabove). Modification of the device of Abeles for guiding an optical mode along the core layer 342 would render the device of Abeles inoperative for its intended purpose, as discussed hereinabove. Applicants respectfully submit that rejection of Claims 26 and 27 under 35 USC §103 over Abeles is improper, and should be withdrawn.

With regard to Claims 1, 12, and 15-18, Examiner has stated that "one of ordinary skill in the art would recognize that modal index matching is a desirable feature when attempting complete power transfer between the device component and the transmission waveguide". However, Abeles only discloses end coupling of optical power, as discussed hereinabove, for which modal index matching is not pertinent.

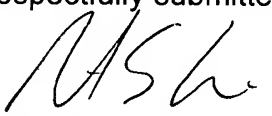
Abeles nowhere shows, teaches, or suggests transverse-coupling for transferring optical power, therefore one of ordinary skill in the art would have no reason to modify the device of Abeles to achieve modal index matching. Applicants respectfully submit that rejection of Claims 1, 12, and 15-18 under USC §103 over Abeles is improper, and should be withdrawn.

Examiner has rejected Claims 19-22 under 35 USC §103(a) as being unpatentable over Abeles in view of Sadot (US6222964).

The rejections are overcome since it is believed that Claims 19-22 patentably distinguish over Abeles in view of Sadot. Applicant respectfully submits that elements and/or limitations of the claim in question are not disclosed, suggested, or motivated by Abeles or Sadot, for the reasons stated hereinabove for Claims 1 and 23. Therefore, rejection of Claims 19-22 under 35 USC 103(a) is improper and should be withdrawn.

In view of the above, it is submitted that Claims 1-4, 12-27, and 47-59 are in condition for allowance. Reconsideration of the rejections is respectfully requested. Allowance of Claims 1-4, 12-27, and 47-59 at an early date, and reinstatement and allowance of non-elected species Claims 5-11, 28-46, and 60-74, is earnestly solicited.

Respectfully submitted,



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